DOCUMENT RESUME

ED 143 456 PS 009 485

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TITLE Feeding and Fussing: Parent-Infant Interaction as a Function of Neonatal Medical Status.
SPONS AGENCY Office of Child Development (DHEW), Washington, D.C.
PUB DATE Mar 77
GRANT OCD-90-C-388
NOTE 17p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (New Orleans, Louisiana, March 17-20, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Arousal Patterns; *Behavior Patterns; *Infant Behavior; *Infants; *Neonates; Observation; *Parent Child Relationship; *Premature Infants
IDENTIFIERS *Brazelton Neonatal Assessment Scale

ABSTRACT

This study examined mother/child interactions during feedings for full-term, healthy premature, and sick premature newborns. Ten first-born infants in each of these categories were observed with their parents once in the hospital, twice at home, and once in the laboratory during the first 4 months of life. Observations focused on the position in which the infant was held; whether infants' eyes were open or closed; vocalizing, touching, movements, amount of fretting, crying and mutual gaze. The Brazelton Scales of Neonatal Assessment were administered to the infants just prior to the first newborn feeding. Data from the Brazelton Scales suggested that the fewer medical problems the baby had, the more likely the baby was to be alert for prolonged periods, responsive to social stimuli, and able to signal distress clearly by crying. Feeding data revealed several trends. At the first feeding, full-term infants were held close to the mother's body more than either sick or healthy prematures. At the 4-month lab visit, there were no differences among the groups on this variable. During the newborn feedings, parents of full-term infants touched and vocalized to their infants more than parents in the other two groups. These differences were no longer evident at 4 months. The two premature groups showed more behavior change from home to lab at 4 months of age than did the full-term group. No clear relationship between fussing during feedings and infants' medical status could be identified. (JMB)

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ED143456

Symposium on Disturbances in Parent-Infant Interaction: Symptoms and Origins
Society for Research in Child Development, New Orleans, 1977

Feeding and Fussing: Parent-Infant Interaction as a Function of Neonatal Medical Status*

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The project described in this paper is supported by OCD Grant No.90-C-388 to Susan Goldberg and is carried out with the co-operation of Boston Hospital for Women

PS009485

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Our research has been guided by a model of parent-infant interaction (Goldberg, in press) which assumes that harmonious social interactions will be facilitated by high levels of parent confidence and infant social competence. We therefore, tried to select groups in which parents' confidence and newborn social skills would differ systematically. There was reason to think that as the medical problems of the newborn increase, both parent confidence and infant skills would decrease giving rise to more stressful interaction situations.

First, for the parents, the birth of a baby with medical problems is often perceived as a failure to produce a normal infant (Caplan, Mason, & Kaplan, 1965; Kaplan & Mason, 1960). Anxiety about the infant's survival and well-being will also increase with the extent of the infant's problems. This is compounded by very concrete evidence that highly specialized care which parents cannot give is required for the baby. Furthermore, even in the most sensitive special care unit for newborns, opportunities for parent-infant interactions are decreased with prolonged hospitalization of a baby. Since there is evidence that the period immediately after birth is an important one for initiating parental behavior, (Kennell & Klaus, 1975), separation at this time can create an additional burden for parents: their opportunities to learn parenting skills and become acquainted with the infant are limited during the period which seems to be an optimal time for doing so. Seashore and her colleagues (Seashore, Leifer, Barnett, & Leiderman, 1973) found that among several groups of mothers, self-confidence was lowest for primiparous mothers of prematures who had not been able to handle them soon after birth. Multiparous mothers (who presumably have previous evidence of their parenting success) were more confident about their parenting skills and were less affected by early separations. We therefore, decided to restrict our study only to families of

first-born infants where a variety of circumstances combine to lower feelings of competence among parents of preterm infants.

At birth, the premature infant can be considered generally less competent than the full-term baby as a consequence of being less mature and more fragile. The younger and more physiologically vulnerable the baby, the more we can expect the demands of survival to consume energy which might otherwise be invested in interactions with the environment. Of necessity, survival comes first and life-sustaining procedures such as instrumental monitoring, drug injections, and forced feeding that might otherwise be considered abusive are frequently required for the most vulnerable infants. Although several experimental stimulation programs appear to promote early development in preterm infants (see Cornell & Gottfried, 1976 for a critical review), little is known about the psychological needs of such infants. Consequently, even in the most caring hospitals little happens which might encourage a premature infant to anticipate social encounters with eagerness. It is likely that at hospital discharge, even though physically healthy, the preterm infant is different behaviorally than the full-term newborn. The parents of a prematurely born infant take home a less competent social partner than the parents of a full-term normal infant, and we will shortly provide evidence to support this assertion.

We have not attempted to separate parent and infant stresses which contribute to interactive difficulties. Tiffany Field will be discussing a study which used this strategy. We wished to observe whether there were interactive behaviors which varied systematically with the amount of stress encountered, and for our purposes it was desirable that both parent and infant stress increase systematically along the continuum from which we selected our groups. We think of our groups as representing different levels of risk for problems in caretaking.

Method

Three groups of 10 first borns and their parents were followed longitudinally over the first year of life: full-term newborns, healthy prematures and sick prematures. Table 1 summarizes some important characteristics of the three groups

and you can see that they differ on all indicators of medical status. Full-term infants were born at term (38-40 weeks) and had no medical problems during their hospital stay. Healthy premature infants were born before 37 weeks of gestation and had no medical problems other than the need to gain weight and mature before going home. Most were able to be fed by parents or nurses from the beginning. Sick premature infants were not only born early, but had medical problems as well; usually these were respiratory problems. In general, these infants were born earlier, weighed less, and spent more time in the hospital than the healthy premature group. For the most part, these infants initially required respiratory monitoring and gavage feeding. We excluded multiple births and small-for-dates infants. Insofar as possible, we tried to match groups for socioeconomic status, sex of infant, and later feeding method by selecting from the smallest and least available groups first. You may be surprised to see that half of our preterm infants were breast fed by the time of discharge. We had the good fortune (or perhaps misfortune for our design) to work at BHW, where the staff was concerned with early attachment and was extremely supportive of parents. In fact, all of our mothers of sick infants visited them daily. If you recall that in Fanaroff, Kennell & Klaus' paper (1972) on visiting patterns in the premature nursery, contacts of 3 times in two weeks were considered "frequent" visiting, you will realize that the families we have followed experienced far less separation than most families of premature infants in previously reported studies. Furthermore, breast-feeding was encouraged, the rationale being that even if the mother was only storing milk for gavage (tube) feedings, this was the one contribution that no medical personnel could usurp. It is possible that some of the group differences we are looking for will have been depressed as a result of such supportive hospital practices, but we cannot in good conscience complain at the families' good fortune.

Since feeding seems to be a central focus of early parent-infant interaction in our culture, we chose feedings as our primary interactive setting in the first four months and these are the observations we will be discussing. For each family,

there were four feeding observations: one in the hospital just prior to discharge, one at home, 10 days post-discharge, one at home at 16 weeks of age, and one in the laboratory at that same age. Note that we did not correct the age of preterm infants in scheduling observations. Age and risk level are therefore confounded. On the other hand, duration of prior interactive experience is more closely matched for the three groups. We will try to indicate where age effects or correlations with age might explain our findings.

During each feeding, two observers coded behavior on a checklist in 10-second periods. Reliability for the behaviors we will be discussing, ranged from .75-.88 for infrequent behaviors such as parent movement and parent smiles, and from .94-100% for frequently occurring behaviors like position and caretaking functions. Regardless of the reliabilities, coding sheets for the two observers were reconciled before any data analyses were done. We recorded the position in which the infant was held, whether the infants eyes were open or closed, vocalizing, touching and movements for both parent and infant. The amount of fretting and crying and mutual gaze were also recorded.

The next few slides provide examples of the positions which were differentiated during coding. The first slide shows what we called the "lap" position, where the infant is held away from the parent's body, at arm's length, with head supported by the parent's hand. The second slide shows the "lap/arms" position, where the infant is held in closer, with the body supported on the lap and the head in the crook of the parent's elbow. The third slide demonstrates the "arms" position, where the infant is cradled by the parent, totally supported in the arms. (Infants were also held up at the shoulder for burping, but we will not be discussing this variable).

In order to assess the infant's social competence, we administered the Brazelton Scales of Neonatal Assessment just prior to the first newborn feeding. We were especially interested in the items which repeatedly cluster together and seem to represent interactive skills. These include orientation to auditory and

visual stimuli, quality of alertness, ease of consoling the baby and cuddliness. However, we will also mention group differences in motor maturity and state organization.

Analysis and Results

We will first discuss the Brazelton data ~~first~~ and then turn to data from the feeding observations. We assigned each infant a score of 1-3 (optimal, average, or worrisome) for each of four a priori clusters as suggested by Brazelton and his co-workers: interactive processes, motoric processes, state organization and response to stress. Our expectation was that we would find progressively more worrisome scores associated with increasing medical problems. On the response to stress cluster, only one infant obtained a worrisome rating. When the other three clusters were examined, we found progressively more worrisome ratings as medical complications increased (Chi square (4 df) = 12.76, $p < .05$). Both the interactive process and motoric process scores showed this pattern. For motoric processes, there was also significant relationship between age and scores, suggesting that this is indeed a maturity cluster. For the interactive process scores, there was no significant relationship with age. Table 2 shows the number of infants obtaining optimal, average, or worrisome scores for the interactive cluster in each group. Although scores for state organization showed no group differences, we had observed that the sicker the baby, the less likely he or she was to cry during the examination. In fact, mothers of sick infants often commented to us that it worried them that they had not heard their babies cry much. Examination of individual items on the Brazelton shows that this observation is supported by the data (Table 3). No sick premature had crying (state 6) as a predominant state although it was common for full-term babies. In addition, items depending on State 6 crying, such as peak excitement, rapidity of buildup to the crying state, and irritability showed the same systematic differences. Although we have not analysed these statistically, the consistency of the pattern is obvious. The sicker the baby, the less able s/he was to give adults clear distress signals. Thus, parents in our three groups

did in fact, bring home behaviorally different babies. The fewer medical problems the baby had, the more likely the baby was to be alert for prolonged periods, responsive to social stimuli, and able to signal distress clearly by crying.

In analysing the feeding data, we hoped at first to find simple, easily observable behaviors which differed systematically with risk level and could, therefore, be considered reliable indices of stress. Thus, we looked first at the proportion of time during feedings that specific behaviors occurred. We expected that as stress increased there would be less mutual gaze, smiling and vocalization and that parents would cuddle and touch their babies less. Furthermore, we expected that fretting and crying as measures of infant distress would be more frequent as stress increased. Some of these expectations were confirmed and others were not. In presenting these data,we will first discusss overall age trends. Then we will examine some of the behaviors which showed the group differences we predicted. Finally, we will discuss some examples of behaviors which did not follow the expected pattern and which we find difficult to interpret.

The analyses we are reporting today are univariate analyses of variance for selected behaviors about which we had made specific predictions and unless otherwise stated, we will only be reporting statistically significant differences. The proportion of time each parent and infant behavior occurred during a feeding was first analyzed for change over all three groups with the passage of time. From the newborn period through the 4 month visits, infants spent more time with their eyes open, ($F=21.71$, $p<.01$), smiled and looked at their parents more, ($F=12.68$, $p<.01$), showed increases in movement, ($F=58.16$, $p<.01$) and in fussing and crying behaviors ($F=11.35$, $p<.01$). There was also an increase in infant (nondistress) vocalizations ($F=15.44$, $p<.01$) from the hospital to the 10-day home visit which continued at about the same rate through the 4th month. Thus, in general, over the first 4 months, infants become more alert, more active, and they smile and look more at their parents. At 4 months, there were some significant home-lab differences, which will be discussed later.

There were also some changes in parental behaviors over the course of 4 months. There was, over time, less stimulation to alertness (jiggling - $F=5.72$, $p<.01$), and less stimulation to suck (jiggling the nipple - $F=4.26$, $p<.01$), which probably reflects changes in the infants' maturity and physical states. There were also changes in the position - in which infants were held during feeding, with the proportion of time spent out on the lap decreasing ($F=6.17$, $p<.01$), while the proportion of time spent in a more proximal lap/arms position increased ($F=11.89$, $p<.01$).

The data were also examined for differences between risk groups in the frequency with which specific behaviors occurred at each observation. The most striking behavior pattern that conformed to our expectation of systematic variation among groups was the amount of time spent in the lap position, as can be seen in Table 4. At the first feeding (hospital), sick prematures were held out on the lap more than healthy prematures, who were held in this position more than full-terms ($F=4.09$, $p<.05$). By the second feeding approximately 10-days later, time spent in the lap position had decreased for the sick prematures so that there was no difference between the two premature groups on this variable; however, both were still held in the lap more than the full-term group ($p<.05$). This same pattern held true for the 4-month home visit. At the 4-month lab visit, there were no differences among the groups on this variable.

This is similar to observations made in other studies of premature infants and their parents (e.g. Leifer et al, 1972) where less proximal and ventral contact are observed than among full-term infants and their parents. There are many possible explanations. One is that there is a developmental pattern of increasingly closer holding which is simply delayed in preterm groups (Klaus & Kennell, 1976). Our data which show changes over time do seem to support this interpretation. It is also possible that the distance at which the infant is held reflects the emotional distance parents feel. It has been suggested (Brazelton, personal communication) that parents of sick infants may adopt this holding position to protect themselves from becoming attached to infants who may not survive. It is

also the case that nurses typically hold sick babies on the lap for feedings and instruct parents to do likewise. They are told that their infants will fall asleep and stop feeding if held too close and cuddled, and they are shown various techniques for alerting the baby. The longer a baby has been in intensive care, the more parents are exposed to nurses as instructional models. These explanations are not mutually exclusive.

Two other behaviors which initially showed the predicted pattern were parent touching and vocalizing to the infant. During the newborn feedings, parents of full-term infants touched and vocalized to their infants more than parents in the other two groups. However, these differences were no longer evident at 4 months.

Although the 2 feedings at 4-months were, at most, a week apart, we did notice some interesting differences. These may be mor situationally influenced than developmental. Infants had their eyes open less, looked at parents less, and smiled less in the lab than in the home ($p < .05$). There was also a tendency to fuss and cry more in the lab than in the home. Parents tended to hold infants closer in the lab than at home ($p < .05$). This was primarily accounted for by home to lab changes among parents of the two risk groups, as the behavior of the parents of the full-terms did not change from home to lab. Similarily, the difference in the amount of fussing and crying between home and lab was mainly a function of the higher risk groups' behavior. It appears that the dyads in the two premature groups were more influenced by external factors than were the full-term pairs.

We had predicted that fussing and crying, as signs of infant distress, would be more prevalent as newborn medical problems increased. Table 5 shows that, in fact, there is no feeding observation for which this was the case. Although sick prematures were less likely to cry during the Brazelton, there were no differences in fussing during newborn feedings. On the basis of the data presented in Table 3, showing that sicker babies tended to cry less during the Brazelton we might have predicted that full-term infants fuss and cry more than

healthy prematures, who cry more than sick prematures. Such a prediction could not be confirmed in the newborn observation, although it appears in the four-month home observation. Thus, our two obvious predictions about group differences in crying were not confirmed. However, since fussing does increase over time for all groups, it may be that each group will reach its peak fussiness at different periods, with sicker babies "peaking" later. Table 5 does indeed suggest that this may be the case.

There were several behavior patterns in which healthy premature infants were unexpectedly different from the other two groups. For example, at all feedings, they spent more noncrying time with their eyes closed and vocalized less than the other 2 groups. At present, these differences are not explainable. Hopefully, more detailed analyses will clarify these observations.

We also have a number of impressions that are, thus far, unconfirmed in the data. For example, we think that at 4 months, we see more solid feedings and force feedings among the preterm babies than among full-term infants. By this, we mean feedings in which the parent persists in feeding after the infant has signaled repeatedly, by rejecting the nipple or spoon, squirming and turning away, and crying, that no further food is desired. In these early analyses, we see nothing in the data to clearly support these impressions. It does not seem to be supported in Table 5. Turning away occurred so infrequently overall that we do not have enough data for statistical analyses. It is clear that of the 2 babies who fussed during half the feedings (or more), both were in the preterm groups. Perhaps more detailed analyses will confirm our impressions or perhaps these 2 very striking incidents were weighted too heavily in our selective memories.

One other impression we have had is that fathers of sicker babies seem more involved in their care. As a crude estimate we've only met 3 fathers of full-term babies on any occasion and of those 3, one was present at every visit: 6 fathers of healthy prematures and 7 fathers of sick prematures have been present at our visits. The amount of participation varies from coming once to being present at every visit

and actually participating in the feeding.

In this study, we have attempted to assess the contributions of both parents and infants to early interactions. We have discussed characteristics of infants differing in levels of medical risks which might have a potential role in environmental interactions, and parental responses to these characteristics.

Overall, the interactions we have observed in our groups seem to be qualitatively different. Some of these differences are captured in the very simple kinds of analyses we have done such as that of the position in which infants are held. Others are clearly not. We have by no means succeeded in "objectifying" clinical impressions but feel that we have a viable strategy for doing so.

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Table 1 - Sample Characteristics

Group	Sex	Inital Feeding Method	$\bar{x}$ Gestational Age in Weeks	$\bar{x}$ Birth Weight (lbs.)	$\bar{x}$ 1 min Apgar	$\bar{x}$ 5 min Apgar	$\bar{x}$ Days in Hospital	$\bar{x}$ Conceptional Age (1st observation)
Full-Term Normal (FT)	5 M 5 F	4 Breast 6 Bottle	39.5 (38-41)	7 lbs. 3oz. (6 lb 7oz.- 8 lbs.2oz.)	8.6 (8-9)	9.3 (9-10)	3.5 (3-5)	40.1 wks. (39-41)
Healthy Premature (HP)	6 M 4 F	5 Breast 5 Bottle	34.8 (31-37)	4 lbs.14oz. (3 lbs.6oz- 6 lbs.15oz)	7.1 (4-9)	8.7 (7-10)	13.2 (6-28)	38.2 wks. (35-40)
Sick Premature (SP)	5 M 5 F	4 Breast 6 Bottle	30.3 (26-33)	3 lbs.6oz. (1 lb.15oz- 5 lbs.6oz.)	6.4 (4-8)	7.6 (6-9)	34.6 (9-69)	37.5 wks. (35-39)
Infants of Diabetic Mothers (IDM)	2 M 8 F	3 Breast 7 Bottle	36.6 (31-39)	7 lbs.2oz. (3 lbs.2oz- 8 lbs.11oz)	6.1 (1-8)	8.2 (5-9)	11.7 (4-40)	37.8 wks. (34-39)

Figures in parentheses indicate the range of scores for each group

Group	Optimal	Average	Worrisome
*FT	1	5	3
*HP	0	5	4
SP	0	3	7

*One baby in each group did not have an initial Brazelton exam

Table 3 - Group Differences in State Organization on Brazelton Scale

Item	Group FT	HP	SP
#Subjects with crying as one predominant state	6	3	0
#Subjects unable to be scored on consolability	0	3	5
$\bar{x}$ rating irritability	5.0	4.1	2.8
$\bar{x}$ rating, peak excitement	6.0	5.5	4.5
$\bar{x}$ rating, rapidity of buildup	4.6	4.5	2.9

All ratings are on a scale of 1-9 with the high end indicating greater irritability peak arousal and rapidity of buildup.

Table 4 - Percent of Time and Lap During Feeding Observation

Group	Hospital	10-Day Home	4 M Home	4 M Lab
FT	24	12	16	14
HP	37	36	38	21
SP	61	35	34	18
	SP > FT ($p < .01$) SP > HP ($p < .05$)	SP=HP > FT ($p < .05$)	SP=HP > FT ($p < .05$)	ns

p values are based on one-tailed t tests following an overall significant F value.

Table 5- Percent of Time Fretting and Crying During a Feeding Observation

	Hospital		10 Day Home		4month Home		4 month lab	
Group	$\bar{x}$	no. of infants	$\bar{x}$	no. of infants	$\bar{x}$	no. of infants	$\bar{x}$	no.of infants
Full Term	.8	(3)	1.3	(5)	10.3	(5)	7.0	(4)
Healthy Premie	.5	(2)	1.0	(4)	6.5	(9)	13.1	(9)
Sick Premie	1.4	(4)	2.6	(4)	2.1	(6)	9.0	(6)